Justification Using Properties of Equality and Congruence

PROPERTIES OF EQUALITY FOR REAL NUMBERS	
Reflexive Property	For any number a, $a = a$.
Symmetric Property	For any numbers a and b, if $a = b$ then $b = a$.
Transitive Property	For any numbers a, b and c, if $a = b$ and $b = c$, then $a = c$.
Addition and Subtraction Properties	For any numbers a, b and c, if $a = b$, then $a + c = b + c$ and $a - c = b - c$.
Multiplication and Division Properties	For any numbers a, b and c, if $a = b$, then $a \ \ c = b \ \ c$ and if $c \quad 0$, then $a \ \ c = b \ \ c$.
Substitution Property	For any numbers a and b, if $a = b$, then a may be replaced with b in any equation.

PROPERTIES OF CONGRUENCE	
Reflexive Property of Congruence	$\overline{AB} \cong \overline{AB}$
Symmetric Property of Congruence	If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$
Transitive Property of Congruence	If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$

Justification Using Properties of Equality and Congruence (Continued)

State the property of equality or property of congruence that justifies each conclusion.

1. Given: $m\angle 1 = m\angle 2$
   $m\angle 2 = 75$
   Conclusion: $m\angle 1 = 75$

2. Given: $\overline{EG} \cong \overline{FG}$
   $\overline{FG} \cong \overline{GH}$
   Conclusion: $\overline{EG} \cong \overline{GH}$

3. Given: $x + 9 = 13$
   Conclusion: $x = 4$

4. Given: $JK = KL$
   $MN = KL$
   Conclusion: $JK = MN$

5. Given: $7x = 63$
   Conclusion: $x = 9$

6. Given: $m\angle 3 = 65$
   $m\angle 4 = 65$
   Conclusion: $m\angle 3 + m\angle 4 = 130$

7. Given: $\angle 1 \cong \angle 2$
   $\angle 2 \cong \angle 3$
   Conclusion: $\angle 1 \cong \angle 3$

8. Given: $\overline{XY}$ is a segment
   Conclusion: $\overline{XY} \cong \overline{XY}$

9. Given: $2x + y = 70$
   $y = 3x$
   Conclusion: $2x + 3x = 70$

10. Given: $\angle A \cong \angle B$
    Conclusion: $\angle B \cong \angle A$

Justification Using Properties of Equality and Congruence (Continued)

Supply the missing reasons for each of the following:

11.

Given: $15y + 7 = 12 - 20y$

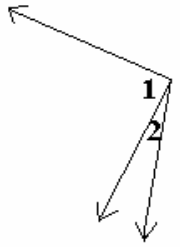
Conclusion: $y = \frac{1}{7}$

Statement	Reason
1. $15y + 7 = 12 - 20y$	1.
2. $35y + 7 = 12$	2.
3. $35y = 5$	3.
4. $y = \frac{1}{7}$	4.

12.

Given: $m\angle 1 + m\angle 2 = 100$
$m\angle 1 = 80$

Conclusion: $m\angle 2 = 20$



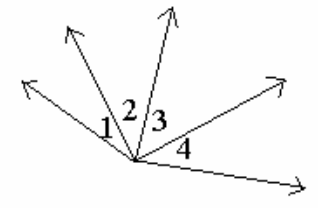
Statement	Reason
1. $m\angle 1 + m\angle 2 = 100$	1.
2. $m\angle 1 = 80$	2.
3. $80 + m\angle 2 = 100$	3.
4. $m\angle 2 = 20$	4.

Justification Using Properties of Equality and Congruence (Continued)

13.

Given: $m\angle 1 = 40$
$m\angle 2 = 40$
$m\angle 1 + m\angle 3 = 80$
$m\angle 4 + m\angle 2 = 80$

Conclusion: $m\angle 3 = m\angle 4$

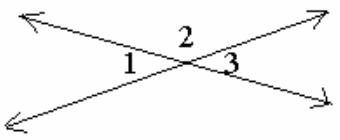


Statement	Reason
1. $m\angle 1 + m\angle 3 = 80$	1.
2. $m\angle 1 = 40$	2.
3. $m\angle 3 = 40$	3.
4. $m\angle 4 + m\angle 2 = 80$	4.
5. $m\angle 2 = 40$	5.
6. $m\angle 4 = 40$	6.
7. $m\angle 3 = m\angle 4$	7.

14.

Given: $m\angle 1 + m\angle 2 = 180$
$m\angle 2 + m\angle 3 = 180$

Conclusion: $m\angle 1 = m\angle 3$



Statement	Reason
1. $m\angle 1 + m\angle 2 = 180$	1.
2. $m\angle 2 + m\angle 3 = 180$	2.
3. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	3.
4. $m\angle 2 = m\angle 2$	4.
5. $m\angle 1 = m\angle 3$	5.

Answers:

1. Transitive Property
2. Transitive Property of Congruence
3. Subtraction Property
4. Transitive Property
5. Division Property
6. Addition Property
7. Transitive Property of Congruence
8. Reflexive Property of Congruence
9. Substitution Property
10. Symmetric Property of Congruence
11. 1. Given
    2. Additive Property
    3. Subtractive Property
    4. Division Property
12. 1. Given
    2. Given
    3. Substitution Property
    4. Subtraction Property
13. 1. Given
    2. Given
    3. Subtraction Property
    4. Given
    5. Given
    6. Subtraction Property
    7. Transitive Property
14. 1. Given
    2. Given
    3. Transitive Property
    4. Reflexive Property
    5. Subtraction Property